Name ____________________ Student Number ____________

All solutions are to be presented on the paper in the space provided. The exam is closed book, no calculators. Time for the exam is 75 minutes.

(1) Solve the following inequalities. Use interval notation for the answers.

(a) $x^2 + x \geq 2$

$$x^2 + x - 2 \geq 0$$
$$(x+2)(x-1) \geq 0$$

	$x < -2$	$-2 < x < 1$	$x > 1$
$x+2$	$-$	$+$	$+$
$x-1$	$-$	$-$	$+$
$(x+2)(x-1)$	$+$	$-$	$+$

So, the solution is $x \in (-\infty, -2] \cup [1, \infty)$

(b) $|x+2| < 1$

$$x + 2 < 1 \quad \text{and} \quad x + 2 > -1$$
$$x < -1 \quad \text{and} \quad x > -3$$

So, $x \in (-3, -1)$.

(2) Write the equation of the line through the points $(1,1)$ and $(2,3)$. Use the point–slope form and solve for y.

$$m = \frac{\Delta y}{\Delta x} = \frac{3-1}{2-1} = 2.$$

The point–slope form is $y - y_0 = m(x - x_0)$. Use $(x_0, y_0) = (1,1)$:

$$y - 1 = 2(x-1)$$
$$y = 2x - 1$$

(3) Evaluate the following:

(a) $\cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$

(b) $\tan\frac{\pi}{6} = \frac{1}{\sqrt{3}}$

(c) $\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

(d) $\sec\frac{\pi}{3} = 2$

(e) $\sin\frac{\pi}{2} = 1$

(f) $\cos\frac{\pi}{2} = 0$

(g) $\sin 0 = 0$

Over→

(h) $\cos 0 = 1$

(i) $\tan \frac{5\pi}{4} = 1$

(j) $\sin \frac{11\pi}{6} = -\frac{1}{2}$

(4) Solve $\sin(2x) = \frac{1}{\sqrt{2}}$ on $[0, \pi]$.

$$2x = \frac{\pi}{4}, \frac{3\pi}{4}$$
$$x = \frac{\pi}{8}, \frac{3\pi}{8}$$

Over→

(5) Find the domain and range of the following functions:

(a) $f(x) = \sqrt{x} + 1$

$$D_f = [0, \infty)$$
$$R_f = [1, \infty)$$

(b) $g(x) = \dfrac{1}{\sqrt{x+1}}$

$$D_g = (-1, \infty)$$
$$R_g = (0, \infty)$$

(6) Find the domain of the following functions:

(a) $f(x) = 2e^x$

$$D_f = (-\infty, \infty)$$

(b) $g(x) = \sqrt{x^2 - 3x - 10}$

$$x^2 - 3x - 10 \geq 0$$
$$(x-5)(x+2) \geq 0$$

	$x < -2$	$-2 < x < 5$	$x > 5$
$x - 5$	$-$	$-$	$+$
$x + 2$	$-$	$+$	$+$
$(x-5)(x+2)$	$+$	$-$	$+$

So the solution $x \in (-\infty, -2] \cup [5, \infty)$.

Over→

(7) Let $f(x) = |x| + 1$ and $g(x) = \sqrt{x-1}$.

(a) What is $(f \circ g)(x)$? Write the answer without absolute value signs.

$$f(g(x)) = f(\sqrt{x-1}) = |\sqrt{x-1}| + 1 = \sqrt{x-1} + 1$$

The absolute value signs are unnecessary since $\sqrt{x-1} \geq 0$.

(b) What is $(g \circ f)(x)$? Write the answer without absolute value signs.

$$g(f(x)) = g(|x| + 1) = \sqrt{|x| + 1 - 1} = \sqrt{|x|}$$

$$= \begin{cases} \sqrt{x} & \text{if } x \geq 0 \\ \sqrt{-x} & \text{if } x < 0 \end{cases}$$

(c) What is the domain of $(f \circ g)(x)$?

$$D_f = (-\infty, \infty)$$

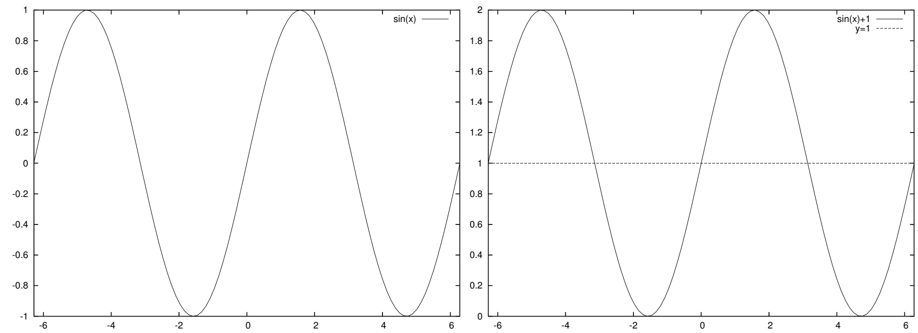
$$D_g = [1, \infty)$$

$$R_g = [0, \infty)$$

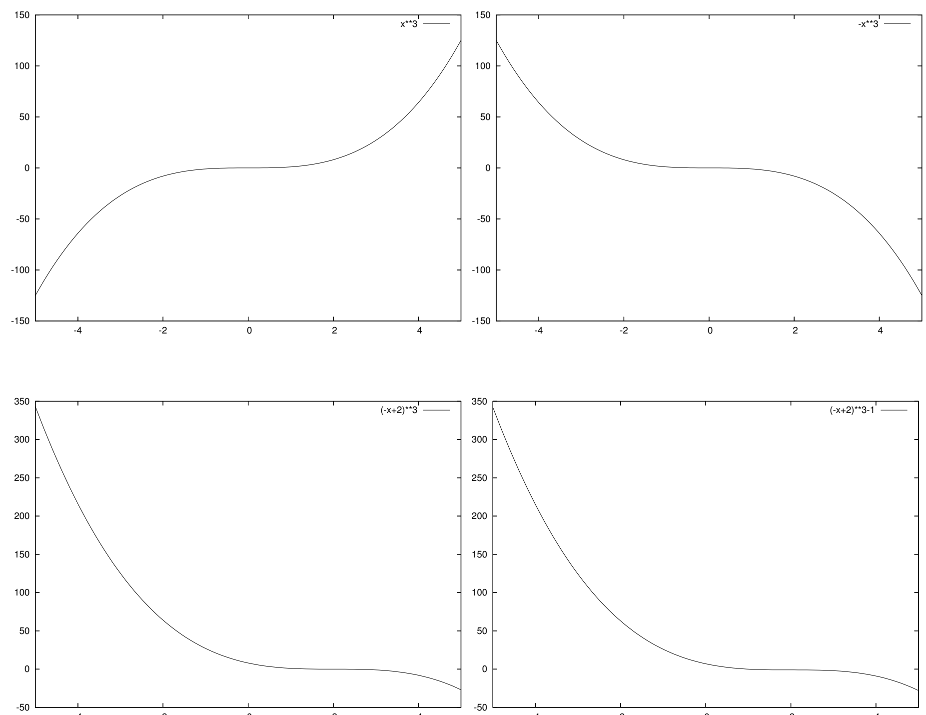
Since R_g is in D_f, we have $D_{f \circ g} = D_g = [1, \infty)$.

(8) Sketch the graph of the following:

(a) $1 + \sin x$



(b) $(-x + 2)^3 - 1$



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